Clinical Effect Analysis of Microscopic Surgery for Epiglottis Cysts with Coblation

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Abstract This study aims to explore the effects and advantages of coblation combined with microscopy to treat epiglottis cysts. Ninety patients with epiglottis cysts were randomly assigned to three groups: the first group: marsupialisation + electric coagulation group, $n = 30$; the second group: marsupialisation + coblation, $n = 30$; and the third group: marsupialisation + coblation + microsurgery, $n = 30$. To compare the cure rate, intraoperative bleeding volume, postoperative pain, operation time and postoperative complications were investigated among these three groups. The comparison among three procedures showed a significant difference for intraoperative bleeding volume, operation time and postoperative pain ($P < 0.05$), whereas no significant difference was observed for cure rate ($P > 0.05$). These three procedures are effective in treating epiglottis cysts. Microscopic surgery with coblation has the advantages of less bleeding, short procedure duration, less pain and few complications. Thus, microscopic surgery is worthy of clinical application.

Keywords Epiglottis cysts · Coblation · Microsurgery · Surgery

Introduction

Epiglottis cyst is a common disease in ear, nose and throat (ENT) departments, mainly because of clogged mucous

gland tubes, resulting in mucous retention, most of which is located at the tongue side of the epiglottis [1–3]. The epiglottis is an important pathway for the pharynx, larynx and oesophagus. Its physiological function is highly important. The epiglottis is sensitive because it is rich in vessels and nerves. Surgery can stimulate the epiglottis and cause laryngospasm and/or edema. Larger cysts can break out and bleed or get infected, resulting in suffocation and jeopardising the life of the patient. Therefore, during surgery for epiglottis cysts, close attention and caution must be given to the procedures by selecting procedures that remove as much of the lesion as possible but reduce bleeding, peripheral tissue injury and the risk of massive haemorrhage and larynx edema [4–7]. In the past, most of the procedures were performed under indirect laryngeal mirror because of the limitation of surgical equipment. Vocal cord polyp cyst forceps were used to tear the top wall of the cysts (marsupialisation). The cyst wall was cleared after the liquid from the cyst flowed out. If bleeding occurred, electric coagulation was used. However, the view field was small, so the risk of relapse was high because of the remaining cyst wall. In addition, bleeding was difficult to stop during the procedure. Massive haemorrhage during the procedure resulted in difficulty for the surgeon. The risks were great and the long-term outcome was not promising [8–10]. In recent years, coblation has been widely used as a new technique in the clinic. Coblation has the advantages of cutting with low temperature, stopping bleeding in time, protecting the mucous, reducing the duration of the procedure and reducing postoperative pain compared with the traditional procedures such as single electrode coagulation, microwave coagulation and laser coagulation [10–12]. The special length of the handle for larynx and the angle-adjustable blade allow ease of access to any site of the larynx, making this method a favourable

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one for ENT surgeries [10, 11, 13]. To explore the efficacy and safety of coblation assistance for epiglottis cysts, we performed different procedures for 90 cases of epiglottis cysts from April 2006 to April 2012.

Subjects and Methods

Clinical Data

Ninety patients (58 males and 32 females; aged 18–65 years, average age of 38.5 years; history of 1–15 years) presented different degrees of pharyngeal foreign body sensation and throat discomfort. Eleven patients exhibited complicated infection with local pain, whereas five reported of dyspnoea. A total of 48 patients had cysts located at the tongue side of the epiglottis, 24 at the epiglottis valley and 18 at the free edge of the tongue and larynx fold. Cyst sizes ranged from 1 cm × 1 cm to 5 cm × 5 cm. Figure 1 shows massive epiglottis cysts. Single cysts were seen in 72 cases, whereas multiple cysts were observed in 18 cases. After patients were admitted, they were randomly assigned into three groups, with 30 cases for each group: the first group: marsupialisation + electric coagulation group; the second group: marsupialisation + coblation; and the third group: marsupialisation + coblation + microsurgery. This study was conducted in accordance with the declaration of Helsinki. This study was conducted with approval from the Ethics Committee of the First Affiliated Hospital of PLA General Hospital. Written informed consent was obtained from all participants.

Surgical Methods

The patient was in a supine position with a cushion under the shoulder and general anaesthesia through a tracheal tube. Supported pharyngeal mirror was guided to explore the tongue side of the epiglottis and to show the relationship

Fig. 1 Massive epiglottis cyst (5 cm × 5 cm), pushing epiglottis downward

between cysts and peripheral tissues. If the cyst was massive, it was punctured and the liquid was sucked out, then the cyst was fixed with a supportive shelf. In the first group (marsupialisation + electric coagulation group), after tearing the cyst wall with the forceps, the base of the cyst was cut with forceps, the top cover of the cyst was removed, the liquid was sucked out, bleeding was stopped with a self-made long electric coagulation and bleeding with significant oozing was stopped using an epinephrine cotton ball and pressure. For the second group (marsupialisation + coblation), the top cover of the cyst was removed (submitted for pathology), an American ArthroCare Ultra 70 (Sunnyvale, CA, USA) blade with power setting of eight was used, the residue of the cyst wall was cut and the power setting of four was used if bleeding occurred. For the third group (marsupialisation + coblation + microscopy), a microscope was placed on the base of the second group, the working distance was set to 400 mm and magnification was 10 times the surgical field. Under the microscope, the edge of the cyst was clearly visible. The sheath of the cyst was removed until reaching the surface of the perichondrium using the power setting of eight. Under the microscope, bleeding spots were clearly visible, which were electrically coagulated using a power setting of four.

After surgery, antibiotics and budesonide with atomising inhalation were administered for 1–3 days.

Efficacy Standard

Cure the cyst disappeared, the sensation of foreign body and obstruction at the pharynx disappeared; *effective*: the cyst disappeared or shrunk significantly, the sensation of foreign body and obstruction at the pharynx reduced; *not effective*: the cyst did not disappear and the symptoms did not improve. *Relapse*: after half a year, a recurrent cyst was detected at the surgical site.

Bleeding volume during the procedure the collected volume of the suctioned liquid was recorded, the haemoglobin concentration of the liquid collected was measured and the bleeding volume was calculated.

Pain score pain presented as ranging from 0 to 10, with 0 for no pain and 10 for the worst pain. Record the pain scores of the same night of the procedure were recorded, then again at 8 am of the second and third postoperative day. The average of these 3 days was calculated.

Complications include postoperative bleeding, infection and dyspnoea.

Statistical Analysis

Data for intraoperative bleeding, pain score and procedure time among groups were compared using *t* test, whereas the χ^2 test was used for cure rate and complications.

Results

After follow up for 0.5–6 years, the data were compared among the three procedures. Intraoperative bleeding, pain score and procedure time were significantly different ($P < 0.05$), being lower in the second and third groups than those in the first group. Compared with traditional marsupialisation with electric coagulation, coblation showed the following advantages: less bleeding, short procedure and less pain after the procedure. No significant difference for cure rate or complications was observed among the three groups (Table 1). Figure 2 shows the wound surface 1 week after the procedure.

Discussion

The most common histological types of epiglottis cysts are retention cysts and infected cysts [14, 15]. When the cysts are small, the patient does not present clinical symptoms. However, the cysts gradually become large because of inflammatory stimulation, trauma and mechanical reasons. The patients feel the sensation of foreign body and obstruction at the pharynx, with blurry voice. The patients also feel throat discomfort because of a secondary infection. When the cysts grow to obstruct the larynx cavity, the patient may experience dyspnoea or even feel life-threatening. If the cysts break, the cyst liquid flows into the trachea along the laryngeal cavity and the patient will cough and even experience dyspnoea and suffocate. Most of the patients have significant clinical symptoms, and the outcome with traditional treatment is not promising. Thus, surgery is needed [16–18].

The mechanism of coblation is by breaking electrolytes in normal saline into sodium ion and chloride ion [19], forming a high-concentration isoelectric ion area around the electrode and obtaining high-speed movement under the isoelectric field. These sodium and chloride ions have enough energy to break down the organic chain within the tissues. Thus, the peripheral tissues are separated and the volume of the tissues are reduced, without directly damaging the tissues and/or doing little damage to the

Fig. 2 The wound surface 1 week after the procedure

peripheral tissues. Given that the electric current did not flow through the tissues directly, the tissues did not generate much heat; thus, the therapy temperature was low. Coblation has the following advantages: (1) surface temperature (40–70 °C); (2) haemostatic ablation of the specific site of tissues by breaking down the molecules; (3) minimises indirect damage to the tissues; (4) minimises heat penetration, protecting peripheral normal tissues when removing the lesion tissues and reducing complications; (5) absence of radiation damage, special odour or smoke, carbonisation and radiation; slight bleeding of the wound; short procedure; the range of treatment is easily controlled; mild reaction for the peripheral tissues; easy-to-heal wounds; and the patient has mild reactions and rapid recovery.

In this study, compared among three groups, we found a significant difference for intraoperative bleeding volume, procedure time and pain score ($P < 0.05$), with those of the second and third groups being lower than those of the first group. The group with coblation had less bleeding, short procedure and less pain than traditional marsupialisation + electric coagulation. A significant difference was detected for intraoperative bleeding volume and pain score between the second and third groups ($P < 0.05$). Fewer intraoperative bleeding and less postoperative pain were observed for the third group compared with the second

Table 1 Clinical efficacy comparison among three procedures

Group	Case numbers	Intraoperative bleeding volume (ml)	Operation time (min)	Pain score (point)	Cure rate (%)	Complications (%)
Marsupialization + electric coagulation ¹	30	52 ± 3.8	15 ± 3.8	6 ± 1.8	81.75	16.67
Marsupialization + coblation ²	30	8 ± 1.6	9 ± 2.1	3 ± 1.1	93.75	6.67
Marsupialization + coblation + microscope	30	4 ± 1.2	8 ± 2.3	2 ± 0.8	100	0
<i>P</i> value		<0.01	<0.05	<0.05	>0.05	>0.05

Comparison among three procedures, there are significant difference for intra-operative bleeding, procedure time and pain score, $P < 0.05$. There is no significant difference for cure rate or complications, $P > 0.05$

group. No significant difference was observed for the cure rate among three groups ($P > 0.05$). All these three procedures are effective methods for treating epiglottis cysts. However, with follow-up, we found three recurrent cases after treatment with five uncured patients for the first group with marsupialisation + electric coagulation and only one uncured patient in the second group with marsupialisation + coblation. The cyst of this patient shrank and his symptoms ameliorated. The treatment was found to be clinically effective, without recurrence. Thus, in the second group, coblation improved the cure rate, and all the patients were cured in the microsurgery group. Statistical analysis did not show a significant difference compared with the first group. This result is due to the small sample size. A larger sample size is needed in future studies. No significant difference was observed for the complications among groups ($P > 0.05$). However, in the first group, two patients had postoperative bleeding at a volume greater than 200 mL; two patients had throat edema, dyspnoea and severe complications; and another had postoperative infection. With coblation, only two patients had postoperative bleeding 7 days after surgery, which is secondary and possibly caused by pseudomembrane drop-off, with bleeding volume <50 mL and neither throat edema nor infection. For the microscope group, no complications were observed.

From this study, we believe that: for the cysts located at the lateral wall of the epiglottis and the valley, abundant vessels exist and these areas easy bleed. Clear field and adequate light are needed to stop bleeding. One hand should be used to hold the coblating handle, and under microscopy, the mucous should be opened with the suction and spread to prevent incomplete haemostasis at the turning point. Oozing blood spots were visible under the microscope. The other hand should be used to hold the specially made coblation blade #70 to stop bleeding. Since the iso-ion blade with normal saline can be used to flush the wound (i.e., wound bleeding is suctioned out), this method can be highly effective in stopping bleeding as long as the haemostatic button is targeted at the bleeding site. This method offers low local temperature to the wound and shortens the haemostasis time. This method can improve the outcome of haemostasis, while reducing the tissue reaction and shortening the procedure time. The postoperative pain degree is related to the time of procedure stimulation, electric coagulation or iso-ion energy and individual physique. Furthermore, the supported laryngeal mirror put local pressure on the soft palate tissue, resulting in sub-mucous clot and local ulcer, which worsened the degree and lengthened the time of postoperative pain. In this study, we observed 90 patients. Pain in the group using electric coagulation lasted longer, sometimes up to 1 month, which may be associated with the large wound

area and long drop-off time of the pseudomembrane. With coblation, the postoperative pain was milder, presented as a needle sensation, accompanied by pain with swallowing as well as discomfort of larynx and pharynx, which is associated with minor tissue injury. Since the mucous of epiglottis and tongue base is loose, edema can easily occur, resulting in throat obstruction. Given the rich nerves in the submucosa of the throat, procedure stimulation may cause throat spasm. Thus, caution should be used to avoid respiratory airway obstruction and suffocation. In this study, in the first group, two patients had dyspnoea after surgery, which was resolved by steroids, antibiotics and symptomatic treatment. One patient had infection, spasm and deformation of the epiglottis cartilage and coughed when swallowing food, which gradually recovered with compensation. No similar situation was observed for the group with coblation.

In summary, compared with the traditional method, microsurgery with coblation for epiglottis cysts is a method with great potential, in terms of field cooperation, fineness and clinical outcome.

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